3/8/01

EPA NEW ENGLAND'S TMDL REVIEW

TMDL: **Meduxnekeag River**
WBS# 152R Class B listed 1998 for nutrient/ps, nps, <2003.
Meduxnekeag watershed in Houlton County (St. John watershed in Canada)
Tribal Interest: Houlton Band of Maliseet Indians (HBMI)
Town: Houlton, Maine

STATUS: Final

IMPAIRMENT/POLLUTANT: A six-mile segment of the Meduxnekeag River is not attaining standards for dissolved oxygen (DO) concentration below the Houlton Water Company (HWC) outfall. The major factor is the diurnal DO effect from the respiration of attached plant growth as a result of phosphorus enrichment. Although occasional, marginal non-attainment of DO standards was also measured above the Houlton outfall, data clearly show that the TP enrichment below the Houlton outfall comes mainly from the Houlton discharge.

BACKGROUND: The Maine Department of Environmental Protection (ME DEP) submitted to EPA New England the final Meduxnekeag River TMDL for total phosphorus (TP) with a transmittal letter dated October 12, 2000 (received by EPA on October 18, 2000). The TMDL submitted includes the following supporting documentation (in reverse chronological order):

1. TMDL Summary Template (ME DEP, October 12, 2000).
2. Summer 2000 Meduxnekeag River Sampling Plan, and Dissolved Oxygen Meter Protocols.
3. Responses to Comments on Draft Meduxnekeag River TMDL (May 2000) including actual comment letters from Acheron Engineering Services, and Houlton Band of Maliseet Indians (ME DEP October 12, 2000).
4. Meduxnekeag River TMDL, Final (ME DEP, September 2000).
5. 1998 & 1999 Data.
6. Meduxnekeag River 1997 Data Report (ME DEP December 1997).
7. Response to comments on revised draft TMDL (ME DEP, November 12, 1996).
8. Meduxnekeag River TMDL (ME DEP, May 1996 revised draft).

Also included in the administrative record file are the following documentation and correspondence. The following is not intended to be a complete list of all documents in the file:

- EPA summary of February 26, 2001 consultation with HBMI.
- EPA response to November 6, 2000 comments from Houlton Water Company (prepared November 22, 2000 for inclusion in EPA approval package).
- Letter of Houlton Water Company comments on final September 2000 TMDL (John L. Clark, HWC, to Stephen Silva, EPA, dated November 6, 2000).
- Letter of EPA review comments on the May 2000 public review draft TMDL (Steve Silva, EPA, to David Miller, ME DEP, dated July 26, 2000).
- Letter of HBMI review comments on the May 1996 revised draft TMDL (Sharri Venno and Tribal Chief, Clair Sabattis, HBMI, to David Miller, ME DEP, dated January 7, 1997).
- Letter of EPA review comments on the May 1996 revised draft TMDL report (Mark

Voorhees, EPA, to David Miller, ME DEP, dated April 10, 1997).

The following review explains how the TMDL submission meets the statutory and regulatory requirements of TMDLs in accordance with §303(d) of the Clean Water Act, and 40 CFR §130.

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REVIEW ELEMENTS OF TMDLs

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.

1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking

The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyl a and phosphorus loadings for excess algae.

The Meduxnekeag River, located in northeastern Maine, is a tributary of the Saint John River, and is ranked as a high priority waterbody (TMDL preparation <2003). A six-mile segment of the Meduxnekeag River, extending from the Town of Houlton's wastewater treatment plant outfall (Houlton Water Company) to the covered bridge, is not attaining standards for dissolved oxygen (DO) concentration, and is included on Maine's 303(d) list for nutrients from both point and nonpoint sources. Survey data as well as model runs indicate that the Meduxnekeag River is not attaining standards for dissolved oxygen (DO) concentration below the Houlton outfall.

A 13.3-mile long segment of the Meduxnekeag River, from the confluence of the south Branch to the Maine/Canada border was studied by Maine DEP to evaluate current water quality and to assess the impact of existing and proposed licensed discharges upon water quality. The major DO non-attainment factor is the diurnal DO effect from the respiration of attached plant growth as a result of phosphorus enrichment. Although occasional, marginal non-attainment of DO standards was also measured above the Houlton outfall (upstream of the 303(d) listed non-

attainment segment targeted in this TMDL), data clearly show that the TP enrichment below the Houlton outfall comes mainly from the Houlton discharge.

ME DEP explains the analytical basis for expressing the nutrient TMDL through surrogate measures (see pages 2-5 of TMDL report). The diurnal range of dissolved oxygen (diel DO) is used to indicate the presence of bottom attached or benthic algae present in the Meduxnekeag River. Actual instream data were used to develop a relationship between diurnal DO range and TP concentration.

Assessment: ME DEP has adequately identified the water body, the pollutant of concern, the magnitude and location of the sources of pollution. The TMDL also includes an adequate description of important assumptions made in developing the TMDL.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

The TMDL for total phosphorus is tied to achieving the target of Maine's water quality criteria for dissolved oxygen (Class B DO minimum criteria are 7ppm or 75% saturation, whichever is higher (see page 2 of TMDL report). There are no direct quantitative standards for algae growth whose respiration is causing the non-attainment of DO standards, so actual instream data were used to develop a relationship between diurnal DO range and TP concentration (page. 2 and D3 of the TMDL report).

Assessment: Adequately addressed. Even though ME DEP admits to a limited database (page 30, 1996 report), EPA agrees that establishing the relationship between diurnal DO range and TP concentration is a good approach to link the phosphorus-based water quality target to the DO water quality standard.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.

In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

Using a calibrated water quality model, QUAL2E, the loading capacity has been presented for the Meduxnekeag River as the TMDL for total phosphorus (TP = 1.77 lbs/day) at 7Q10 flow conditions (see page 11 in TMDL report). The loading capacity has been defined for summer critical low flow conditions when algae growth is highest and high water temperatures contribute to low dissolved oxygen levels. Maine state law requires that seven day ten year low flow (7Q10) be used to compute a river's assimilative capacity. Modeling assumptions are addressed in the final and 5/96 draft TMDL reports.

By definition, TMDLs are equal to the sum of the WLAs, LAs, and background loads (along with a margin of safety). Allowable pollutant loads for the Meduxnekeag River are presented for two point source discharges (WLAs), background level, and nonpoint source contributions (LAs) (See Fig. 5, page 11 of TMDL report).

Assessment: EPA New England concludes that the loading capacity has been appropriately set at a level necessary to attain applicable water quality standards. EPA agrees that the technical approach used by Maine is reasonable and sufficient for establishing a TMDL to address dissolved oxygen impairments in the Meduxnekeag River.

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 C.F.R. § 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

Modeling shows that the dissolved oxygen problem is predominantly due to point source pollution. For this reason, the TMDL does not specify NPS load reductions to meet water quality standards.

The TMDL clearly presents load allocations for non-point sources of pollution, 0.45lbs/day TP to background nonpoint source pollution immediately above the Houlton discharge, and 0.07 lbs/day TP to the tributaries downstream of Houlton. The background and tributary allocations in the TMDL include both natural background levels of TP and human-induced nonpoint sources

of TP, and are presented as gross allotments.

Assessment: EPA New England concludes that load allocations are adequately specified in the TMDL. We agree that, given the existing data, it was not possible to separate natural background from human-induced nonpoint sources. Since the load allocations in this TMDL reflect current NPS loadings, the TMDL implies that there are no additional allocations for future sources of NPS. For this reason, EPA agrees that ME DEP's recommendation for the continued implementation of nonpoint source controls is important.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.

Based on modeling analysis, the TMDL clearly presents the TP WLA for:

- Staley (0 during critical conditions when the TMDL is in effect; 1.14 lbs/day TP otherwise) (See pages 2, and 10-11 of TMDL report),
- Houlton Water Company (1.25 lbs/day TP).

Staley's WLA is set at zero because "A.E. Staley is not permitted to discharge when river flow at the outfall (above the confluence of the South Branch Meduxnekeag) is less than 30 cfs, or when DO as measured at the two bridge sites below Houlton are less than 7.0 mg/l." See pages 2 and 10 TMDL report.) At times when river flow is above 30 cfs at Staley, Staley's permitted TP loading would have an insignificant impact on diurnal DO. (See page 2 TMDL report.)

As far as HWC's allocation is concerned, Maine's analysis shows that "TP loading from the treatment plant represents 98.5% of the TP input to the river below the outfall under no treatment conditions" (assuming 7Q10 of 7.6 cfs, background of 11 ug/l TP, full licensed flow of 1.5 MGD, and average effluent TP concentration of 2,500 ug/l) (page 8 of TMDL report). "Background phosphorus data (from above the discharges) indicate little contribution from nonpoint sources compared to the significant increase in TP below the Houlton outfall." (Page 3 Appendix D of TMDL report.) Houlton discharge was not given a less stringent WLA based on the assumption that any nonpoint source load reductions will occur.

The required maximum TP loading from Houlton is set at 1.25 lb/day using diurnal DO vs. Houlton TP discharge curve (see Fig. 32 on page 33 of 5/96 report). ME DEP's allocation method is based on a model run showing that a 45% reduction in diurnal DO range is needed to meet a Class B water quality DO criterion of 7.0 mg/l (see page 30 of 5/96 report). A required average diurnal range of 3.23 mg/l is calculated using the average diurnal range below Houlton under 7Q10 conditions.

Data collected during 1997 provides an additional check on the TP allocation method, and helped ME DEP to set a recommended concentration effluent limit for Houlton of 0.25 mg/l TP (see pages 3-4 of the 1997 data report) to be applied from June 1 - September 15. This level is based on a monthly average mass limit applied at performance effluent flow, instead of design flow. (Houlton's average flow during the summer 1997 was 0.5 MGD, or 1/3 the licensed design flow of 1.5 MGD.)

Assessment: EPA New England concludes that the WLAs of the TMDL are acceptable and reasonable. The TMDL identifies the Houlton Water Co. as the dominant source of pollutant loading to the river. The WLAs set pollutant loads so that water quality standards will be met. Water quality modeling predicts compliance with water quality standards once a summer permit limit for phosphorus is implemented by HWC, and if summer permit limits on the Staley discharge are maintained (no discharge, as explained above).

ME DEP has provided information on recommended effluent limits which indicates how ME DEP intends to implement the TMDL. (EPA's approval of the TMDL does not extend to approval of the ME DEP recommended permit conditions; of course, effluent limits issued in the permit must be consistent with the WLA developed within the TMDL.) A concentration effluent limit for TP is to be applied a month earlier than the TMDL-based mass limit is applied. (See discussion under seasonal variation.) EPA notes that the recommended concentration effluent limit of 0.25 mg/l (based on performance flow) is not as stringent as a concentration of 0.1 mg/l corresponding to the TMDL at design flow. EPA concurs with ME DEP that the higher effluent limit provides some level of protection, especially during the month prior to the seasonal start of the TMDL, and will attain water quality standards when effluent flows are less than 0.6 MGD. In 1997, the plant demonstrated that it can achieve an effluent TP concentration of about 0.25 mg/l with treatment at a performance flow of about 0.5 MGD, and "DO standards are predicted to be attained (with verification by the 1997 data)" (see page 3 of 1997 data report).

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

The TMDL for TP includes an implicit margin of safety to account for any lack of knowledge concerning the relationship between effluent limitations and water quality. "The QUAL2E and

empirical TP modeling, by incorporating 7Q10 river flow (which occurs infrequently) in combination with maximum license BOD loads (Houlton routinely discharges 10% or less of permitted BOD5), includes a degree of implicit MOS.

Assessment: EPA New England concludes that the conservative design conditions and assumptions used provide for adequate MOS in the TMDL.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1).

The phosphorus WLAs for the TMDL are established only for the summer period (1.25 lb/day, July 1 - Sept 15) when benthic algae growth is an issue (pages 11 and 13 of TMDL report). In the non-summer months, the cooler water temperature and reduced light intensity greatly diminish algae growth to the point where it is no longer an issue.

A concentration limit of 0.25 mg/l (based on performance flow, not design flow) is recommended to start a month earlier, and be in effect from June 1 - Sept. 15.
Assessment: EPA New England concludes that seasonal variations have been adequately accounted for in the TMDL. The WLAs for TP are only necessary in summer and are not needed to ensure compliance with water quality standards in the non-summer months when temperatures are lower, directly affecting dissolved oxygen, when light intensity is reduced, and algal growth is significantly reduced.

EPA also concurs that starting application of the TMDL in July is reasonable. The Meduxnekeag River flow data for 1997 (see Table 3 on page 4 and Fig. 4 on page 8 of 1997 data report) show considerably higher flows during June which reportedly scour away attached algae, and flush out pollutants (personal communication with David Miller, ME DEP 10/25/00). Monitoring results can be used to assess whether, in the future, the TMDL (mass load allocation) needs to be applied earlier in the season.

8. Monitoring Plan for TMDLs Developed Under the Phased Approach

EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), recommends a monitoring plan when a TMDL is developed under the phased approach. The guidance recommends that a TMDL developed under the phased approach also should provide assurances that nonpoint source controls will achieve expected load reductions. The phased approach is appropriate when a TMDL involves both point and nonpoint sources and the point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. EPA's guidance provides that a TMDL developed under the phased approach should include a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards.

ME DEP states that "a monitoring plan will be developed at the time that recommended TP limits are implemented in the Houlton permit" (page 13 of TMDL report), and recommends parameters to be monitored, frequency of sampling, and QA/QC procedures. (The state

discharge license issued March 31, 2000 will be reopened "within 30 days of finalizing the TMDL... to incorporate new mass and concentration limits for total phosphorous."(page 11 of the TMDL report).) DEP further anticipates that DEP (Presque Isle office), the Houlton Band of Maliseets, and the Houlton treatment plant personnel will participate in the monitoring.

Assessment: Adequately addressed, though not required.

9. Implementation Plans

On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.

Prediction that the TMDL will meet water quality standards is based on point source control to improve water quality in the 6-mile segment of the Meduxnekeag River below the Houlton discharge. The TMDL report identifies Houlton Water Company as responsible for 98.5% of the TP input to the river below the outfall. The reductions in TP point source loadings will be controlled through NPDES permits issued by the ME DEP.

Comment: Addressed, though not required.

10. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

Although the point sources of TP were not given higher allocations on the assumption of reductions in nonpoint sources, ME DEP points out several nonpoint source control efforts that have been completed or are underway in the watershed (see pages 12-13 of TMDL report).

Comment: Addressed, though not required.
The Meduxnekeag River is listed on Maine's "Nonpoint Source Priority Watersheds List"

(Approved 10/15/98) as well as the 1998 303(d) list of impaired waters. These two listings give eligible NPS remediation projects in the Meduxnekeag River watershed preference for funding by ME DEP. For this reason, EPA thinks it is reasonable to assume that ME DEP will also support future NPS controls, if necessary.

11. Public Participation

EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2)).

Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

With a cover letter dated June 20, 2000, ME DEP mailed copies of the 5/00 public review draft TMDL to interested parties, including Houlton Band of Maliseet Indians, Houlton Water Company, A.E. Staley, Acheron consultants, and EPA. In June 2000, ME DEP also issued public notice of availability of the 5/00 public review draft of the Meduxnekeag TMDL with a deadline for comment of July 26, 2000. Written responses to public comment on the draft TMDL report were provided in the final TMDL submittal.

Assessment: EPA New England concludes that ME DEP involved the public during the development of the TMDL for the Meduxnekeag River, has provided adequate opportunities for the public to comment on the TMDL, and has provided reasonable responses to the public comments.

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